

MOLECULAR SIEVES BASED NANO-COMPOSITE UV-RESISTANT MATERIAL,
PREPARATION PROCESS AND USE THEREOF

FIELD OF THE INVENTION

The present invention relates to the preparation of UV-resistant materials. More particularly, the present invention material, in particular, it relates to an UV-resistant materials material which is comprise made with crystalline porous materials material such as zeolite molecular sieve sieves and mesoporous molecular sieve being sieves that support the host and the nano-cluster nano-clusters of TiO₂, ZnO, CeO₂, and Fe₂O₃. being the guest. The present invention also further relates to the preparation methods and uses of the UV-resistant materials. method and the use thereof.

BACKGROUND OF THE INVENTION

By reason As a result of the development of modern industry, the atmospheric pollution is getting worse worsening and the damage level of the ozonesphere ozonsphera is seriously increasing serious increasingly in recent years. It is an imminent problem to resist the ultraviolet radiation in quite a number of the fields. The hazard of excess UV is mainly incarnated in the following aspects:

- 1: The peptide chain chains of the protein will be damaged when an organism is exposed to uv irradiation, resulting irradiate on the organism, which result in the production produce of free radicals. radicles. The free radicals

radicals will further react act with other peptide chains and eventually result in tissue damage and gene mutation. For a human body, it will result in skin burn injury and the production produce of skin cancer. Using sun-prevent cosmetics is one of the efficient ways to prevent these resolve the above problems.

2: The ultraviolet light ultraviolet light is as a high energy wavelength ray which leads will lead to molecular molecule industrial product aging and shortening the lives of products. lifeshortening. Therefore, in general, UV-resistant agents are added to high molecular molecule products, will be added with UV-resistant agent.

In some countries, such as the United States, Japan and Europe, the research and the use of sun-prevent cosmetics cosmetic have reached a high level and sun-preventative sun-prevent cosmetics have become a key focus point of the developing development of cosmetics cosmetic for skincare. The annual growth rate of sun-preventative sun-prevent cosmetics is 5-10% in Europe. It has been reported that the yield of sun-preventative sun-prevent cosmetics accounted for a half of the inventory of the cosmetics in 1990 in the United States. In China, our country, with the rapid progress of the living standard, and enhancement of people's consciousness of aesthetics and health care, many people are paying more attention to UV protection. The increasing growth rate of the sun-preventative sun-prevent product market in China has remained our countries is kept above 20% from the 1990s. metaphase. Moreover, UV-resistant agents are agent is also used more and more, used. In the plastic materials and material, rubber industries, and paint industry, especially in in the paint industry, highly active and steady UV-resistant agents have always been a key point of research and development. R&D.

The At present, developed UV-resistant materials include two main classes of chemical and physical, with the at present. The use of the former is being more popular. The chemical Chemical UV-resistant agents in general are organic compounds, therefore compounds. Therefore, they have good compatible, but they also generally have certain toxicity and irritancy to the skin. They are not compatible consistent with the healthy current health concerns of people, at the present, because it is easy to cause anaphylaxis when they are used in the products which come in direct contact with the skin, directly. In addition, the organo-UV-resistant agents always have bad photostability and they will decompose or become oxidized when exposed to UV radiation. be decompounded or oxidised under uvioize. The development of nanotechnology nanometer techniques allows for solutions for resolving the above problems. They There are physical UV-resistant agents developed with nanotechnology, nanometer techniques, i.e. the e.g., abio-nanometer UV-resistant agents. Abio-nanometer UV-resistant agents have characteristics of stabilization and broad-spectrum resistance which broad-spectrum, they make up for the disadvantages of the organo-UV-resistant agents to a certain degree. With the application, the The shortcomings of abio-Nanometer UV-resistant agents have been increasingly apparent as applications have been developed. come out increasingly. The surface activity is the most typical shortcoming, typically. By reason Beacuse of the high surface energy of the abio-Nanometer particles, when they are mixed with the an organic phase, coacervation easily occurs and results it is easy to occur coacervation and resulting in the inactivation inactivating of the UV-resistant agents. In addition, Together, the security is also one of the potential problems encountered in of the application of the nanometer particles.

For instance, nano-ZnO and nano-TiO₂ have photocatalytic photocatalysis reactivity and will produce free radicals radicals when exposed to under daylight, it will do resulting in harm to human DNA, of human body. John Kownland et al. of Oxford have researched the negative effects effect of and ZnO extensively, deeply. It is stated that TiO₂ and ZnO produce oxygen and oxyhydrogen free radicals radicals in photoillumination. Different from the knowledge of the people, Contrary to prior belief, it has been proven is proved that it is oxyhydrogen free radicals that radicles do harm to human DNA, of the human body, while oxygen radicals do not. Therefore, the method of adding oxygen radical scavenging agent agents to proof the prevent harm caused by of TiO₂ and ZnO is not enough. The nano-cluster assembling Nano-cluster assemblies with molecular sieve sieves being the host or supports can resolve the above problem drastically.

Molecular A molecular sieve is a kind of crystalline and porous material. Its porous channels have a channel has characteristic of narrow distribution of pore size and high-ordered microstructure, in microscopic. Using the porous channel structure of a molecular sieve as a template, template and assembling the guest molecules molecule into the porous channels results in a channel, high ordered nano-cluster arrangement, can be obtained. The assembling technique can not only ensure the dispersion disperseion of the nano-cluster, but can also enhance the performance of the nano-cluster to a large extent. Many assembling methods have been developed in this field. In researching the assembling methods of semiconductor-guest, coordination compound-guest and some macromolecule organo-guest, a kind of technique known as “ship in bottom” has been developed. In short, this method is to introduce introduces the guest monomer micromolecules micromolecule into the porous channels channel of the molecular sieve, then

initiates initiate the condition of synthetic reaction in the porous channels channel to occur causing a the combination reaction. To use Using an in situ synthetic method in-situ sometimes has goodish provides a good effect when assembling some nitrogen-containing or nitrogen-based organo-guests. nitrogen-containing based organo-guest. The composite materials obtained from by the above methods method behave as macro granulometric patterns pattern professedly yet have nano-cluster characteristics, virtually. Furthermore, By reason because of the template action of the porous channels channel of the molecular sieve, the guests guest behave as in an ordered microscopic microscopic height. As a result, it let the material properties can be changed by an occur changes of order of magnitude, to a large extent.

This type of assembling methods appears particularly suitable high application merit in sun-preventative sun-prevent cosmetics, coatings, rubber and plastics industries, industry. Whether using the conventional organo-ultraviolet absorption material, materials or the new style abio-ultraviolet abio—ultraviolet absorption materials, material, they can place the technical group of these materials can be placed into the porous channels channel of the molecular sieve to avoid the coacervation of nanometer particles, and this particles. This technical solution can also farthest reduce the side-effect of the ultraviolet absorption agent. It is more important that the performance of ultraviolet absorption can be extremely enhanced extremely by reason of the high ordered microscopic microscopic state of the ultraviolet absorption agent.

One object of the present invention is to provide a kind of UV-resistant materials, material.

Another object of the present invention is to provide the method of

~~preparation of said methods for preparing the UV-resistant materials. material.~~

Another object of the present invention is to provide ~~uses for the use of said~~ UV-resistant ~~materials. material.~~

The description of the invention

The present invention provides a UV-resistant ~~materials~~ material which use molecular sieve based host-guest nano-composite materials as the ultraviolet absorption ~~agents. agent.~~ The host is selected from one or more than one material of micro- and mesoporous molecular ~~sieve-type materials~~ ~~sieves types~~, such as X, Y, A, STI, ZSM-5, MCM-41 and the series thereof, and SBA and the series thereof, ~~the thereof.~~ The guest-cluster is selected from one or more than one material of TiO₂, ZnO, CeO₂, and Fe₂O₃. This kind Of UV-resistant material ~~uses use the microscopic microcosmic~~ ordered porous ~~channels~~ channel of the molecular sieve as a template. The guest-cluster is ~~directional~~ directionally with high-order by the quantum confinement effect. ~~The In the~~ nano-cluster it can be ensured that only the interval plane of the nano-clusters exist ~~steadily, but also steadily.~~ In addition, the performance is improved greatly.

The present invention also provides two preparation methods of the UV-resistant material.

The first preparation method uses any one or more than one material of TiCl₃, Ti(NO₃)₃, ZnCl₂, Zn(NO₃)₂, CeCl, Ce(NO₃)₃, FeCl₃, Fe(NO₃)₃, FeSO₄ as the initiating material to synthesize the host-guest nano-composite materials by means of ion exchange, which are TiO₂, ZnO, CeO₂, Fe₂O₃ metal oxide nano-cluster and the molecular sieve ~~compound, the compound.~~ The product is used as the ultraviolet absorption agent to obtain the UV-resistant ~~materials. material.~~

This method includes include following steps: dissolving the initiating material in the water, adding the molecular sieve, stirring at room temperature temeperature for 3-12 hours, filtrating, washing, and torrefying at 400-600°C for 4-24 hours.

Alternatively, dissolving the initiating material in the water, adding low-silicon molecular sieve, resting for 1 hours, filtrating, washing and drying at 80°C, and torrefying for at 500°C 12 hours.

The second preparation method uses use butyl titanate as the initiating material to synthesize host-guest nano-composite materials of TiO₂ cluster within a molecular molecular sieve compound by means of hydrolytic reaction, the reaction. The product is used as the ultraviolet absorption agent to obtain the UV-resistant materials. material.

This method include following steps: mixing butyl titanate with high-silicon molecular sieve in non-polar solvent, solvent with inert gas shielding, refluxing and agitating at 50-100°C for 4-48 hours, washing the product by with an alcohol type solvent, drying at 60-100°C, and torrefying for 4-24 hours at 400-600°C.

The Present present invention further provides the use uses of the UV-resistant material materials In cosmetics, coatings, rubber ,coatings ,Rubber and plastics industries. industry.

Embodiment

The present invention will be further described with reference to expatiated with the following examples, but non-limiting examples to which the invention is not to be considered limited, to the examples given herein.

Example 1

Assembling of X zeolite and ZnO.

- 1) ~~Weighing out~~ 10.00g of $\text{Zn}(\text{NO}_3)_2$ was weighted out and dissolved dissolving it in 40 ml deionized water;
- 2) ~~Weighing out~~ 2.00g of X zeolite, mixing with zeolite was weighted out and mixed in the above solution, while maintaining the pH equal to pH at 4~5;
- 3) ~~Electromagnetic stirring~~ The mixture was electromagnetically stirred stirring for 1 hour hours at 40~50°C;
- 4) ~~Resting~~ After resting a moment, pouring discarding the supernatant liquor was poured off and discarded after delamination, weighing out and 10.00g of $\text{Zn}(\text{NO}_3)_2$, $\text{Zn}(\text{NO}_3)_2$ was weighted out and dissolved dissolving it in 40ml water, followed by electromagnetic stirring for 1 hour; hours:
- 5) ~~Repeating the step~~ Step 4 for was repeated three times, followed by filtrating the solution in a by buchner funnel in the last time, repetitive washing by deionized water was performed to remove the impurity ions ion in the solution and Zn^{2+} out of the framework of the zeolite molecular sieve, then placing the resulting product was placed it in an oven and dried oven, drying for about 30 minutes at 60°C;
- 6) ~~Triturating the~~ The obtained product was triturated in an agate mortar for 10~15 minutes, then placing it placed in a 30ml firepot, and torrefied torrefying for 6 hours by in a muffle furnace at 550°C;
- 7) ~~Taking~~ The powdered product was taken out the firepot and triturated firepot, triturating the powder form for 10~15 minutes, minutes by replacing it into the muffle furnace, furnace and torrefying for 6 hours under the same condition to obtain the product H-X-ZnO powder form.

Example 2

Assembling of Y zeolite and ZnO.

- 1) ~~Weighing out 10.00g of Zn(NO₃)₂ was weighted out and dissolved~~ dissolving it in 40 ml deionized water;
- 2) ~~Weighing out 2.00g of Y zeolite, mixing with zeolite was weighted out and mixed in~~ the above solution, maintaining the pH equal to ~~solution which was maintained at a pH of 4~5;~~
- 3) ~~Electromagnetic stirring~~ The solution was subjected to electromagnetic stirring for 1 ~~hour~~ hours at 40~50°C;
- 4) ~~Resting a moment, discarding~~ After resting, the supernatant liquor was discarded after delamination, ~~and weighing out 10.00g of Zn(NO₃)₂, Zn(NO₃)₂ was weighted out and dissolved~~ dissolving it in 40ml water, ~~water and subjected to~~ electromagnetic stirring for 1 ~~hour~~; hours;
- 5) ~~Repeating the step~~ Step 4 was repeated for three times, ~~filtrating times and then~~ the solution was filtered in a by buchner funnel in the last time, ~~time followed by~~ repetitive scrubbing by deionized water to remove the impurity ~~ions~~ ion in the solution and Zn²⁺ out of the framework of the zeolite molecular sieve, ~~then placing it in an oven, the resulting product was placed in an oven and dried~~ drying for about 30 minutes at 60°C;
- 6) ~~Triturating the~~ The obtained product was triturated in an agate mortar for 10~15 minutes, then placing it ~~placed~~ in a 30ml firepot and torrefied firepot, torrefying for 6 hours by ~~in a~~ muffle furnace at 550°C;
- 7) ~~Taking~~ The powdered produce was taken out the firepot, ~~triturating firepot and~~ triturated the powder form for 10~15 minutes, ~~minutes by~~ replacing it into the muffle furnace, ~~torrefying furnace and torrefying~~ for 6 hours under the same

condition to obtain the product H-Y-ZnO powder form.

Example 3

Assembling of A zeolite and ZnO.

- 1) ~~Weighing out 10.00g of Zn(NO₃)₂ was weighted out and dissolving it dissolved in 40 ml deionized water;~~
- 2) ~~Weighing out of 2.00g zeolite, mixing zeolite was weighted out and mixed with the above solution, maintaining the PH equal to solution which was maintained at a pH of 4~5;~~
- 3) ~~Electromagnetic stirring The solution was subjected to electromagnetic stirring for 1 hours hour at 40~50°C;~~
- 4) ~~Resting a moment, discarding After resting, the supernatant liquor was discarded after delamination, weighing out and 10.00g of Zn(NO₃)₂, dissolving it Zn(NO₃)₂ was weighted out and dissolved in 40ml water, water and subjected to electromagnetic stirring for 1 hours;~~
- 5) ~~Repeating the step Step 4 was repeated for three times and then the solution was filtered in a times, filtrating the solution by buchner funnel in the last time, time followed by repetitive washing by in deionized water to remove the impurity ion ions in the solution and Zn²⁺ out of the framework of the zeolite molecular sieve, then placing it in an oven, drying the resulting product was placed in an oven and dried for about 30 minutes at 60°C;~~
- 6) ~~Triturating the The obtained product was triturated in an agate mortar for 10~15 minutes, then placing it placed in a 30ml firepot, torrefying firepot and torrefied for 6 hours by in a muffle furnace at 550°C;~~
- 7) ~~Taking The powdered produce was taken out of the firepot, triturating the~~

~~powder form and triturated for 10~15 minutes, replacing it then replaced into the muffle furnace, torrefying furnace and torrefied for 6 hours under the same condition to obtain the product H-A-ZnO powder form.~~

Example 4

Assembling of STI zeolite and ZnO.

- 1) ~~Weighing out 10.00g of Zn(NO₃)₂ was weighted out and dissolving it dissolved in 40 ml deionized water;~~
- 2) ~~Weighing out 2.00g of STI zeolite, mixing with zeolite and mixed into the above solution, maintaining the PH equal to solution and maintained at a pH of 4~5;~~
- 3) ~~Electromagnetic~~ The solution was subjected to electromagnetic stirring for 1 hours hour at 40~50°C;
- 4) ~~Resting a moment, discarding~~ After resting, the supernatant liquor was discarded after delamination, weighing out and 10.00g of Zn(NO₃)₂, dissolving it Zn(NO₃)₂ was weighted out and dissolved in 40ml water, water and subjected to electromagnetic stirring for 1 hour; hours;
- 5) ~~Repeating the step~~ Step 4 was repeated for three times and then the solution was filtered in a times, filtrating the solution by buchner funnel in the last time, time followed by repetitive washing by in deionized water to remove the impurity ions ion in the solution and Zn²⁺ out of the framework of the zeolite molecular sieve, then placing it in the heatingoven, drying the resulting product was placed in an oven and dried for about 30 minutes at 60°C;
- 6) ~~Triturating the~~ The obtained product was triturated in an agate mortar for 10~15 minutes, then placing it placed in a 30ml firepot, torrefying firepot and

torrefied for 6 hours by in a muffle furnace at 550°C;

7) Taking The powdered produce was taken out of the firepot, triturating the powder form firepot and triturated for 10~15 minutes, replacing it minutes then replaced into the muffle furnace, torrefying furnace and torrefied for 6 hours under the same condition to obtain the product H-STI-ZnO powder form.

Example 5

Assembling of ZSM-5 zeolite and ZnO.

- 1) Weighing out 10.00g of Zn(NO₃)₂ was weighted out and dissolving it dissolved in 40 ml deionized water;
- 2) Weighing out 2.00g of ZSM-5 zeolite, mixing with zeolite and mixed into the above solution, maintaining the PH equal to solution and maintained at a pH of 4~5;
- 3) Electromagnetic The solution was subjected to electromagnetic stirring for 1 hour hours at 40~50°C;
- 4) Resting a moment, discarding After resting, the supernatant liquor was discarded after delamination, weighing out and 10.00g of Zn(NO₃)₂, dissolving it Zn(NO₃)₂ was dissolved in 40ml water, water and subjected to electromagnetic stirring for 1 hour; hours;
- 5) Repeating the step Step 4 was repeated for three times and then the solution was filtered in a times, filtrating the solution by buchner funnel in the last time, time followed by repetitive washing by in deionized water to remove the impurity ions ion in the solution and Zn²⁺ out of framework of the zeolite molecular sieve, then placing it in an oven, drying the resulting product was placed in an oven and dried for about 30 minutes at 60°C;

6) Triturating the The obtained product was triturated in an agate mortar for 10~15 minutes, then placing it placed in a 30ml firepot, torrefying firepot and torrefied for 6 hours by in a muffle furnace at 550°C;

7) Taking The powdered produce was taken out on the firepot, triturating the powder form firepot and triturated for 10~15 minutes, replacing it minutes then replaced into the muffle furnace, torrefying furnace and torrefied for 6 hours under the same condition to obtain the product ZSM-5-ZnO powder form.

Example 6

Assembling of MCM-41 zeolite and ZnO.

1) Weighing out 10.00g of $Zn(NO_3)_2$ was weighted out and dissolving it dissolved in 40 ml deionized water;

2) Weighing out 2.00g of MCM-41 zeolite, mixing with zeolite and mixed into the above solution, maintaining the PH equal to solution and maintained at a pH of 4~5;

3) Electromagnetic The solution was subjected to electromagnetic stirring for 1 hour hours at 40~50°C;

4) Resting a moment, discarding After resting, the supernatant liquor was discarded after delamination, weighing out and 10.00g of $Zn(NO_3)_2$, dissolving it $Zn(NO_3)_2$ was weighted out and dissolved in 40ml water, water and subjected to electromagnetic stirring for 1 hour; hours;

5) Repeating the step Step 4 was repeated for three times and then the solution was filtered in a times, filtrating the solution by buchner funnel in the last time, time followed by repetitive washing by in deionized water to remove the impurity ions ion in the solution and Zn^{2+} out of the framework of the zeolite

~~molecular sieve, then placing it in the heating oven, drying the resulting product was placed in an oven and dried for about 30 minutes at 60°C;~~

~~6) Triturating the The obtained product was triturated in an agate mortar for 10~15 minutes, then placing it minutes then placed in a 30ml firepot, torrefying firepot and torrefied for 6 hours by in a muffle furnace at 550°C;~~

~~7) Taking The powdered produce was taken out the firepot, triturating the powder form firepot and triturated for 10~15 minutes, replacing it minutes then replaced into the muffle furnace, torrefying furnace and torrefied for 6 hours under the same condition to obtain the product H-MCM-ZnO powder form.~~

Example 7

Assembling of X zeolite and Fe_2O_3 .

~~1) Weighing out 10.00g of FeSO_4 was weighted out and dissolving it dissolved in 40 ml deionized water;~~

~~2) Weighing out 2.00g of X zeolite, mixing with zeolite was weighted out and mixed into the above solution, maintaining the PH equal to solution and maintained at a pH of 4~5;~~

~~3) Electromagnetic The solution was subjected to electromagnetic stirring for 1 hours hour at 40~50°C;~~

~~4) Resting a moment, discarding After resting, the supernatant liquor was discarded after delamination, weighing out 10.00g of FeSO_4 , dissolving it FeSO_4 was weighted out and dissolved in 40ml water, water and subjected to electromagnetic stirring for 1 hour; hours;~~

~~5) Repeating the step Step 4 was repeated for three times and then the solution was filtered in a times, filtrating the solution by buchner funnel in the last~~

time, time followed by repetitive washing by in deionized water to remove the impurity ions ion in the solution and Fe^{2+} out of the framework of the zeolite molecular sieve, then placing it in an oven, drying the resulting product was placed in an oven and dried for about 30 minutes at 60°C;

6) Triturating the The obtained product was triturated in an agate mortar for 10~15 minutes, then placing it placed in a 30ml firepot, torrefying firepot and torrefied for 6 hours by in a muffle furnace at 550°C;

7) Taking The powdered produce was taken out the firepot, triturating the powder form firepot and triturated for 10~15 minutes, replacing it minutes then replaced into the muffle furnace, torrefying furnace and torrefied for 6 hours under the same condition to obtain the product $H\text{-}X\text{-}Fe_2O_3$ powder form.

Example 8

Assembling of Y zeolite and Fe_2O_3 .

1) Weighing out 10.00g of $FeSO_4$ was weighted out and dissolved dissolving it in 40 ml deionized water;

2) Weighing out 2.00g of Y zeolite, mixing with zeolite and mixed into the above solution, maintaining the PH equal to solution and maintained at a pH of 4~5;

3) Electromagnetic The solution was subjected to electromagnetic stirring for 1 hour hours at 40~50°C;

4) Resting a moment, discarding After resting, the supernatant liquor was discarded after lamintion, weighing out and 10.00g of $FeSO_4$, dissolving it $FeSO_4$ was weighted out and dissolved in 40ml water, water and subjected to electromagnetic stirring for 1 hours hours;

5) Repeating the step Step 4 was repeated for three times and then the

solution was filtered in a times, filtrating the solution by buchner funnel in the last time, time followed by repetitive washing by in deionized water to remove the impurity ions ion in the solution, then placing it in an oven, drying the resulting product was placed in an oven and dried for about 30 minutes at 60°C;

6) Triturating the The obtained product was triturated in an agate mortar for 10~15 minutes, then placing it placed in a 30ml firepot, torrefying firepot and torrefied for 6 hours by in a muffle furnace at 550°C;

7) Taking The powdered produce was taken out the firepot and triturated firepot, triturating the powder form for 10~15 minutes, replacing it minutes then replaced into the muffle furnace, torrefying furnace and torrefied for 6 hours under the same condition to obtain the product H-Y- Fe_2O_3 powder form.

Example 9

Assembling of A zeolite and Fe_2O_3 .

1) Weighing out 10.00g of FeSO_4 was weighted out and dissolved dissolving it in 40 ml deionized water;

2) Weighing out 2.00g of A zeelite, mixing with zeolite was weighted out and mixed in the above solution, maintaining the PH equal to solution and maintained at a pH of 4~5;

3) Electromagnetic The solution was subjected to electromagnetic stirring for 1 hour hours at 40~50°C;

4) Resting a moment, discarding After resting, the supernatant liquor was discarded after lamintion, weighing out 10.00g of FeSO_4 , dissolving it FeSO_4 was weighted out and dissolved in 40ml water, water and subjected to electromagnetic stirring for 1 hour; hours;

5) Repeating the step Step 4 was repeated for three times and then the solution was filtered in a times, filtrating the solution by buchner funnel in the last time, time followed by repetitive washing by in deionized water to remove the impurity ions ion in the solution, then placing it in an oven, drying the resulting product was placed in an oven and dried for about 30 minutes at 60°C;

6) Triturating the The obtained product was triturated in an agate mortar for 10~15 minutes, then placing it placed in a 30ml firepot, torrefying firepot and torrefied for 6 hours by in a muffle furnace at 550°C;

7) Taking The powdered produce was taken out the firepot, triturating the powder form firepot and triturated for 10~15 minutes, replacing it minutes then replaced into the muffle furnace, torrefying furnace and torrefied for 6 hours under the same condition to obtain the product H-A-Fe₂O₃ powder form.

Example 10

Assembling of STI zeolite and Fe₂O₃.

1) Weighing out 10.00g of FeSO₄ was weighted out and dissolved dissolving it in 40 ml deionized water;

2) Weighing out 2.00g of STI zeolite, mixing with zeolite was weighted out and mixed into the above solution, maintaining the PH equal to solution and maintained at a pH of 4~5;

3) Electromagnetic The solution was subjected to electromagnetic stirring for 1 hour hours at 40~50°C;

4) Resting a moment, discarding After resting, the supernatant liquor was discarded after lamintion, weighing out 10.00g of FeSO₄ again, dissolving it FeSO₄ was weighted out and dissolved in 40ml water, water and subjected to

electromagnetic stirring for 1 hour; hours;

5) ~~Repeating the step Step 4 was repeated for three times and then the solution was filtered in a times, filtrating the solution by buchner funnel in the last time, time followed by repetitive washing by in deionized water to remove the impurity ions ion in the solution, then placing it in an oven, drying the resulting product was placed in an oven and dried for about 30 minutes at 60°C;~~

6) ~~Triturating the The obtained product was triturated in an agate mortar for 10~15 minutes, then placing it placed in a 30ml firepot, torrefying firepot and torrefied for 6 hours by in a muffle furnace at 550°C;~~

7) ~~Taking The powdered produce was taken out the firepot, triturating the powder form firepot and triturated for 10~15 minutes, replacing it minutes then replaced into the muffle furnace, torrefying furnace and torrefied for 6 hours under the same condition to obtain the product H-STI- Fe_2O_3 powder form.~~

Example 11

Assembling of MCM-41 zeolite and Fe_2O_3 .

1) ~~Weighing out 10.00g of $FeSO_4$ was weighted out and dissolved dissolving it in 40 ml deionized water;~~

2) ~~Weighing out 2.00g of MCM-41 zeolite, mixing with zeolite and mixed into the above solution, maintaining the PH equal to solution and maintained at a pH of 4~5;~~

3) ~~Electromagnetic The solution was subjected to electromagnetic stirring for 1 hour hours at 40~50°C;~~

4) ~~Resting a moment, discarding After resting, the supernatant liquor was discarded after lamintion, weighing out and 10.00g of $FeSO_4$, dissolving it $FeSO_4$~~

was weighted out and dissolved in 40ml water, water and subjected to electromagnetic stirring for 1 hour; hours;

5) Repeating the step Step 4 was repeated for three times and then the solution was filtered in a times, filtrating the solution by buchner funnel in the last time, repetitive washing by in deionized water to remove the impurity ions ion in the solution, then placing it in an oven, drying for about 30 minutes at 60°C;

6) Triturating the The obtained product was triturated in an agate mortar for 10~15 minutes, then placing it placed in a 30ml firepot, torrefying firepot and torrefied for 6 hours by in a muffle furnace at 550°C;

7) Taking The powdered produce was taken out the firepot, triturating the powder form firepot and triturated for 10~15 minutes, replacing it minutes then replaced into the muffle furnace, torrefying furnace and torrefied for 6 hours under the same condition to obtain the product H-MCM-Fe₂O₃ powder form.

Example 12

Assembling of CeO₂ nano-cluster in X, Y, A, ZSM-5, STI, and MCM-41 zeolite.

1) Weighing out 10.00g of Ce(NO₃)₂ was weighted out and dissolved dissolving it in 40 ml deionized water;

2) Weighing out 2.00g of zeolite (any one of X, Y, A, ZSM-5, STI, and MCM-41) was weighted out and mixed into), mixing with the above solution, maintaining the pH equal to solution and maintained at a pH of 4~5;

3) Electromagnetic The solution was subject to electromagnetic stirring for 1 hours hours at 40~50°C;

4) Resting a moment, discarding After resting, the supernatant liquor was discarded after delamination, weighing out and 10.00g of Ce(NO₃)₂, dissolving it

Ce(NO₃)₂ was weighted out and dissolved in 40ml water, water and subjected to electromagnetic stirring for 1 hour; hours;

5) Repeating the step Step 4 was repeated for three times and then the solution was filtered in a times, filtrating the solution by buchner funnel in last time, repetitive washing by in deionized water to remove the impurity ions ion in the solution, then placing it in an oven, drying the resulting product was placed in an oven and dried for about 30 minutes at 60°C;

6) Triturating the The obtained product was triturated in an agate mortar for 10~15 minutes, then placing it placed in a 30ml firepot, torrefying firepot and torrefied for 6 hours by in a muffle furnace at 550°C;

7) Taking The powdered produce was taken out the firepot, triturating the powder form firepot and triturates for 10~15 minutes, replacing it minutes then replaced into the muffle furnace, torrefying furnace and torrefied for 6 hours under the same condition to obtain the product.

Example 13

Assembling of TiO₂ nano-cluster in X, Y, A, ZSM-5, STI, and MCM-41 zeolite.

1) Weighing out 10.00g of TiCl₃ was weighted out and dissolved dissolving it in 40 ml deionized water;

2) Weighing out 2.00g of zeolite (any one of X, Y, A, ZSM-5, STI, and MCM-41) was weighted out and mixed into), mixing with the above solution, maintaining the PH equal to solution and maintained at a pH of 4~5;

3) Resting The solution rested for 1 hour hours at room temperature;

4) Filtrating, The rested solution was filtered and the filtrate was repetitively washed in repetitive washing by deionized water to remove the impurity ions ion in

the solution, then ~~placing it placed~~ in an even, ~~drying oven and dried~~ for about 30 minutes at 60°C;

5) ~~Triturating the~~ The obtained product was triturated in an agate mortar for 10~15 minutes, then ~~placing it placed~~ in a 30ml ~~firepot, torrefying firepot and torrefied~~ for 6 hours ~~by~~ in muffle furnace at 550°C;

7) Taking ~~The powdered produce was taken~~ out the ~~firepot, triturating the powder form firepot and triturated~~ for 10~5 minutes, ~~replacing it minutes then replaced~~ into the muffle furnace, ~~torrefying furnace and torrefied~~ for 6 hours under the same condition to obtain the product.

Example 14

The preparation of acrylic acid-azyl varnish:

	wt%
Acrylic resin (70% solid content)	52.2
amino resin (70% solid content)	22.3
Tinnvin 292	0.5
Tinnvin 1130	0.8
drainning silicea (10%)	5.0
butyl acetate	5.0
dimethylbenzene	10.0
ethylene glycol monobutyl ether acetate	2.7
n-butyl alcohol	1.5

Synthetic method

1 ~~Weighing mainly resin~~ Resin such as acrylic resin and amino resin were precisely

weighted out and placed precisely, placing them into clean and separated vessels;

2 ~~First, adding A~~ high boiling point solvent such as butyl acetate and ethylene glycol butyl ether acetate was added into resin to make it be diluted, diluted while gradually increase increasing the stirring rate;

3 ~~Weighing out required~~ The Tinuvin 272 was precisely weighted out and diluted with precisely, diluting it by a few butyl acetate or dimethylbenzene to make it be dispersed;

4 ~~Weighing out different~~ Different kinds of auxiliary agents such as draining draining silica and diluting them were weighted out and diluted by the same method and then adding them into the vessel;

5 ~~Adding the left solvents~~ The remaining solvent were added into the vessel, dispersing vessel and the contents were dispersed under high speed (2000~3000rpm) for 20~30mins.

Example 15

The preparation of the sun block:

	wt%
A: refining water	50
polyoxyalkylene	12
polyacrylic acid solution	2
sodium lauryl sulfate	0.5
caisson	0.1
B: isopropyl myristate	10
isopropyl palmitate	10
acetylated lanolin	5

t-butyl hydroxyl anisole	0.05
C: nano-composite UV-resistant agent	8
mica powder	1
D: fragrance essence	0.85

Synthetic method:

Mixing and stirring A, Components A and B respectively mixed and stirred to make cause them be resolved, emulsifying the components A, B, C, and C were emulsified and component then adding E was added thereto and the resultant mixture was rested into the former, resting for 24 hours .